PETDS CONFERENCE, APRIL 9-11 2014

ABSTRACTS OF THE TALKS

Hillel Furstenberg, Hebrew U.
Qualitative Laws of Large Numbers.

Abstract:
If $X_1, X_2, \ldots, X_n, \ldots$ is an iid sequence of non-singular matrices, and we form the "random product" $Y_n = X_1 * X_2 * X_3 * \cdots * X_n$ and let $n \to \infty$ we find that the Y_n tend to have a certain form. We analyze this phenomenon.

Alexander Kachurovskii, Sobolev Inst. Maths
Rates of convergence in ergodic theorems
The talk is based on the joint survey with my student Ivan Podvigin.

Abstract:
The estimates of the rates of convergence will be given in the talk: in von Neumann's ergodic theorem - via the rate of correlations decay, and via the singularity at zero of the spectral measure of the function being averaged with respect to the corresponding dynamical system; in Birkhoff's ergodic theorem - via convergence rate in von Neumann's ergodic theorem, and via large deviations rate of decay. The reasons of naturalness of obtaining these very estimates, are discussed. Estimates of convergence rates in both ergodic theorems are given for important in applications classes of dynamical systems, including some well-known billiards and Anosov systems.

Vadim Kaimanovich, U of Ottawa
Boundary actions of random subgroups
Joint work with Jan Cannizzo.

Abstract:
One of the most basic questions one can ask about a general measure class preserving action of a countable group is that about its conservativity vs. dissipativity (i.e., absence or presence of non-trivial wandering sets). If one looks at the action of a subgroup on the boundary of an ambient group, then for general subgroups this action may well be

conservative, dissipative or mixed, whereas the action of normal subgroups is usually conservative. I will show that the boundary actions of random subgroups on the Poisson boundary of an ambient group is always conservative provided the distribution of these subgroups is stationary (in particular, invariant). The proof uses rigidity properties of the Radon-Nikodym cocycle of Poisson boundary bundles and their equivariant quotients.

Haya Kaspi, Technion Haifa Israel

The Analysis and Control of Queueing Systems Using Measure Valued Processes

`Based on joint work Kavita Ramanan, Rami Atar and Nahum Shimkin.`

ABSTRACT: Measure Valued Processes have been used in recent years to analyze queueing systems. In this lecture we shall deal with many servers queueing systems in which customers with i.i.d service times and i.i.d inter arrival times enter the service on a First Come First Serve basis. We assume that there are N servers, where arrival rate is of order N and the service distribution is independent of N . Such systems are hard to analyze for finite N , but for large N one can obtain Fluid(Law of Large Number) limits and Diffusion(CLT) limits of the underlying queueing process. Our process is composed of two components. The first is the number of customers in the system and the second, which is a measure valued process, puts a unit mass at the ages (amount of time in service) of the customers in service. In the first part of the talk I'll describe the fluid limit of this queuing system and of a similar system that also allows reneging. In the second part I'll discuss an example of the control of such a system. We'll discuss a queueing system with several customer classes under a fixed, non preemptive, priority assignments, and identify the limiting behavior of the queue as the unique solution of the corresponding measure valued fluid equations. We show that in the limit, as both $N \to \infty$ and the time goes to infinity, the preemptive and the corresponding non preemptive assignments policies give rise to the same solution. When patience has exponential distribution (with different parameters for different classes of customers) we show that, for a natural cost function, a rather simple fixed priority assignment rule, which depends only on the means of the services distributions and the patience is asymptotically optimal at equilibrium.

Mike Keane, Wesleyan U.
The Conjugacy Class of a Constant Length Substitution.

Abstract:

Primitive constant length substitutions generate minimal symbolic dynami- cal systems, thus dividing substitutions of the same length into topological conjugacy classes. In this lecture we present a general procedure which de- cides whether two given substitution systems of the same constant length are topologically conjugate. We show that each class contains at least one and only finitely many one-to-one substitutions, as well as infinitely many which are not one-to-one. An effective method is given for listing all one- to-one substitutions in any given class. As examples, the Toeplitz conjugacy class contains three one-to-one substitutions (two on two symbols and one on three symbols), and the (length two) Thue-Morse conjugacy class contains twelve substitutions, among which are two on six symbols. We do not yet understand how to accomplish a similar task for substitutions of nonconstant lengths.

Dong Han Kim, Dongguk University - Seoul, Korea.
Subword complexity and Sturmian colorings of regular trees
`This is joint work with Seonhee Lim.`

Abstract:

In this talk, we introduce subword complexity of colorings of regular trees. We characterize colorings of bounded subword complexity and then introduce Sturmian colorings, which are colorings of minimal unbounded subword complexity. We classify Sturmian colorings using their type sets. We show that any Sturmian coloring is a lifting of a coloring on a quotient graph of the tree which is a geodesic or a ray, with loops possibly attached, thus a lifting of an "infinte word". We further give a complete characterization of the quotient graph for eventually periodic ones. We will provide several examples.

Wolfgang Krieger, Heidelberg.
Semigroups in symbolic dynamics.

Abstract:

Since the introduction of sofic systems their construction by the use of semigroups (and of labelled directed graphs) has become a familiar topic in symbolic dynamics. We describe classes of subshifts that were constructed more recently by using labelled directed graphs and semigroups. The semigroups reappear as invariants of flow equivalence.

Basic results of the theory of these semigroup invariants of subshifts are discussed. Open problems are formulated.

Mariusz Lemanczyk, NCU, Torun.
On Möbius disjointness.

Abstract:
I will present some recent results concerning Sarnak's conjecture on orthogonality of the arithmetic Möbius function with topological systems of zero entropy.

Nir Lev, Bar Ilan U.
Sets of bounded discrepancy for multi-dimensional irrational rotation.
`This is joint work with Sigrid Grepstad.`

Abstract:
The equidistribution theorem for the irrational rotation of the circle may be stated by saying that the discrepancy $D(S,n) := N(S,n) - n\mathrm{mes}(S) = o(n)$ where S is any set whose boundary has measure zero, and $N(S,n)$ is the number of points falling into S among the first n points in the orbit.

In was discovered that for certain special sets, it may actually happen that the discrepancy remains bounded. Hecke and Kesten characterized the intervals with this property, called "bounded remainder intervals".

In this talk I will discuss Hecke-Kesten phenomenon in multi-dimensional setting.

Mordechay Levin, Bar Ilan U.
An Almost Sure Invariance Principle and nonconventional limit theorems for $\mathbb{Z}_+^d$-actions by toral endomorphisms.

Abstract:
Let $A_1, ..., A_d$ be $s \times s$ partially hyperbolic commuting integer matrices, f, g Hölder's continue functions, and $\mathbf{x}$ a uniformly distributed random variable in $[0,1]^s$. In this talk, I will discuss a central limit theorem and a law of the iterated logarithm for the following multisequence

$$\sum_{n_1=1}^{N_1} ... \sum_{n_d=1}^{N_d} f(A_1^{n_1} \cdots A_d^{n_d}\mathbf{x}) g(A_1^{n_1^2} \cdots A_d^{n_d^2}\mathbf{x}),$$

and an almost sure invariance principle for $\sum_{n=1}^{N} f(B_n\mathbf{x})$ where $B_n = A_1^{v_1(n)} \cdots A_d^{v_d(n)}$ is a variant of the Hardy-Littlewood-Pólya sequence (the multiplicative semigroup generated by a finite set $(q_1, ..., q_d)$ of coprime integers, arranged in increasing order). The main tool is the S-unit theorem.

Elon Lindenstrauss, Hebrew U.

Topological and measureable joinings of $\times 2 \times 3$ *and other higher rank actions*

`Mainly based on joint work with Zhiren Wang.`

ABSTRACT:

I will describe results on joinings of higher rank actions such as the $\times 2 \times 3$ action, with an emphasis on understanding topological self joining of such actions, where both theorems and apparently challenging open problems will be presented.

Tom Meyerovitch, Ben Gurion U.

A converse to Kleiner's theorem on groups with finite dimensional Lipschitz harmonic functions.

`Based on joint work with Ariel Yadin.`

ABSTRACT:

A theorem of B. Kleiner asserts that for finitely generated groups of polynomial growth, the space of harmonic functions of growth bounded by any given polynomial is finite dimensional. Kleiner's result yielded a new proof of Gromov's theorem on groups of polynomial growth, namely that such groups are virtually nilpotent. Conjecture: If a finitely generated group satisfies the conclusion of Kleiner's theorem, it must be virtually nilpotent. In this talk we will present some results in this direction. In particular, we establish the above conjecture for finitely generated linear groups. A key ingredient in the proof is construction of a non-negative Lipshcitz harmonic functions, inspired by the analysis of random walks on the lamplighter group.

Hitoshi Nakada, Keio U.

On normal numbers with respect to α*-continued fraction expansions.*

ABSTRACT:

We show that any real number is normal with respect to the regular continued fraction expansion if and only if it is normal with respect to the α-continued fraction expansion. This was first proved by C. Kraaikamp and H. Nakada (2000) for $1/2 \leq \alpha < 1$. Now we claim that this holds for any $\alpha, 0 < \alpha < 1$.

Donald Ornstein, Stanford U.

Stability of diffeomorphisms of the disc and stability of geodesic flow.

ABSTRACT:
I will present results about invariant curves for mappings of the 2-dimensional disc, some old, some new and compare these to the stability of the geodesic flow.

Yuval Peres, Microsoft Research.
Quantitative finitary coding and invariant matching.

ABSTRACT:
The beautiful and special finitary coding by Meshalkin (1959) was based on translation-invariant matching. Keane and Smorodinsky (1979) proved the existence of finitary codings for general Bernoulli schemes of equal entropy. Parry and Schmidt showed that finitary isomorphisms that are not permutations must have infinite expected coding length. With Nate Harvey (ETDS 2011), we proved that informational variance is an invariant for finitary codings where coding length has a finite half moment; this leads to conjectures on invariants for codings with other moments. I will also survey work with Holroyd, Pemantle and Schramm (2009) on translation-invariant matching, motivated by the interpretation of the Meshalkin matching as stable in the sense of the Gale-Shapley (1962) stable marriage theorem. Finding the critical moments of the matching remains open.

Klaus Schmidt, Vienna U.
Entropy and growth rate of periodic points of algebraic $\mathbb{Z}^d$ actions.

Jean-Paul Thouvenot, U. Paris 6
TBA.

Boris Tsirelson, TAU.
Moderate deviations on different scales: no relations.

ABSTRACT:
An example of a discrete-time stationary random process whose sums follow the normal approximation within a given part of the region of moderate deviations, but violate it outside this part.

Dalibor Volny, U. de Rouen
Bernoullicity and the central limit theorem.

ABSTRACT:
When extending study of the CLT by martingale approximation to random fields, bernoullicity turns out to be more important than in the one dimensional case.